

# **AGRICULTURAL METALS I**

## **Curriculum Content Framework**

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# Curriculum Content Framework

## AGRICULTURAL METALS I

**Grade Levels: 10, 11, 12**  
**Course Code: 491007**

**Prerequisites: Agriculture Science and Technology; Agriculture Mechanics I; Agriculture Mechanics II**

Course Description: This course covers safety, technical information, and fabrication concepts. Students will work with hot and cold metal. Safety practices and performance skills will be emphasized in each area.

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# Unit 1: Introduction to Agriculture Metals

## 10 Hours

Terminology: Agriculture, Career, Metal, Occupation, Welding

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
1.1 Define terms		Foundation	Reading	Follows written directions [1.3.13]
			Writing	Applies rules of grammar, punctuation, capitalization, and spelling [1.6.3]  Presents answers/conclusions in a clear and understandable form [1.6.13]
1.2 Identify examples of metal work in the agricultural industry		Foundation	Reading	Applies information to job performance [1.3.4]
		Personal Management	Career Awareness, Development, and Mobility	Draws conclusions from what is read [1.3.12]
		Thinking	Creative Thinking	Comprehends ideas and concepts related to metal work in the agricultural industry [3.1.3]  Makes connections between seemingly unrelated ideas [4.1.6]

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
1.3 Discuss careers available to people with various levels of skill in agricultural metals	1.3.1 Research a career in agricultural metals to find the amount of training required, working conditions, and expected pay.	Foundation	Reading	Determines what information is needed [1.3.10]  Uses standard occupational resource materials [1.3.22]
		Personal Management	Career Awareness, Development, and Mobility	Develops skills to locate, evaluate, and interpret career information [3.1.4]  Explores career opportunities [3.1.5]  Identifies continuing changes in male/female roles at home and work [3.1.7]

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
1.4 List FFA activities and programs of interest to students involved in agricultural metals		Foundation	Speaking	Asks questions to obtain information [1.5.4]  Participates in conversation, discussion, and group presentations [1.5.8]
		Interpersonal	Teamwork	Contributes to group with ideas, suggestions, and effort [2.6.2]  Works effectively with others to reach a common goal [2.6.6]
		Personal Management	Career Awareness, Development, and Mobility	Establishes and implements a plan of action [3.1.5]  Meets defined goals and objectives [3.1.10]  Sets well-defined and realistic personal/career goals (short-term and long-term) [3.1.11]

## Unit 2: Safety Orientation and Procedures

### 10 Hours

Terminology: Decibel, Noise duration, Noise intensity, Safety, Safety colors

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
2.1 Define terms		Foundation	Reading	Follows written directions [1.3.13]
			Writing	Applies rules of grammar, punctuation, capitalization, and spelling [1.6.3]  Presents answers/conclusions in a clear and understandable form [1.6.13]
2.2 Explain hazards associated with agricultural metals	2.2.1 Demonstrate proper lab procedures and first aid methods for accidents.	Foundation	Listening	Listens to follow directions [1.2.6]  Responds nonverbally to conversation [1.2.9]
		Interpersonal	Leadership	Encourages/Motivates members of a group or team [2.4.6]  Organizes group in planning and performing a specific task [2.4.9]
		Personal Management	Integrity/ Honesty/ Work Ethic	Complies with safety and health rules in a given work environment [3.2.2]  Follows established rules, regulations, and policies [3.2.5]

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
2.3 Identify safety colors used in the agricultural mechanics lab	2.3.1 Inspect the agricultural mechanics lab to determine whether proper safety colors are being used.	Foundation	Writing	Records data [1.6.16]  Uses technical words and symbols [1.6.20]  Writes appropriate entries [1.6.22]
		Interpersonal	Negotiation	Comprehends ideas and concepts related to safety [2.5.2]
		Personal Management	Responsibility	Pays close attention to details [3.4.8]
2.4 Discuss protective clothing and equipment which should be worn/used when working with agricultural metals	2.4.1 Show and demonstrate proper protective clothing and equipment.	Foundation	Science	Follows safety guidelines [1.4.15]
			Speaking	Organizes ideas and communicates oral messages to listeners [1.5.7]
		Interpersonal	Coaching	Helps others learn new skills [2.1.3]
		Personal Management	Integrity/ Honesty/ Work Ethic	Describes desirable worker characteristics [3.2.3]  Follows established rules, regulations, and policies [3.2.5]

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
2.5 Explain the importance of proper eye protection	2.5.1 Show proper and improper forms of protective eyewear.	Foundation	Listening	Listens for content [1.2.3]  Listens for long-term contexts [1.2.7]
		Personal Management	Responsibility	Comprehends ideas and concepts related to eye protection [3.4.2]
		Thinking	Knowing How to Learn	Locates appropriate learning resources to acquire or improve knowledge and skills [4.3.3]  Processes new information as related to workplace [4.3.5]
2.6 Identify the classes of fires		Foundation	Writing	Records data [1.6.15]  Takes notes from various sources [1.6.18]
		Personal Management	Responsibility	Displays high standards of attendance [3.4.5]  Is punctual to class, school meetings, and work [3.4.6]
		Thinking	Decision Making	Comprehends ideas and concepts related to fire classification [4.2.2]



CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
2.7 Determine types and locations of fire extinguishers in the agricultural mechanics lab	2.7.1 Demonstrate proper actions to take if there is a fire in the agricultural mechanics lab.	Foundation	Science	Follows safety guidelines [1.4.16]
			Speaking	Speaks effectively using appropriate eye contact, gestures, and posture [1.5.11]
		Interpersonal	Teamwork	Comprehends ideas and concepts related to teamwork during emergencies [2.6.1]
				Works effectively with others to reach a common goal [2.6.6]

## Unit 3: Cold Metal Preparation

### 10 Hours

Terminology: Alloy, Anneal, Ferrous, Malleable, Non-ferrous, Tempering

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
3.1 Define terms		Foundation	Reading	Follows written directions [1.3.13]
			Writing	Applies rules of grammar, punctuation, capitalization, and spelling [1.6.3]  Presents answers/conclusions in a clear and understandable form [1.6.13]
3.2 List cold metal safety practices		Foundation	Listening	Comprehends ideas and concepts related to cold metal safety practices [1.2.1]  Listens to follow directions [1.2.6]  Responds nonverbally to conversation [1.2.9]
		Thinking	Reasoning	Extracts rules or principles from written information [4.5.4]  Uses logic to draw conclusions from available information [4.5.6]

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
3.3 Identify types of metal stock		Foundation	Reading	Locates pertinent information in documents such as manuals, graphs, and schedules to perform tasks [1.3.18]
		Personal Management	Responsibility	Exerts a high level of effort and perseverance towards goal attainment [3.4.4]
		Thinking	Problem Solving	Draws conclusions from observations, evaluates conditions, and gives possible solutions [4.4.5]
3.4 Identify cold metal tools	3.4.1 Demonstrate the use of the following cold metal tools: hacksaw, cold chisel, file, and drill.	Foundation	Reading	Reads and follows instructions to operate technical equipment [1.3.19]  Uses appropriate materials and techniques as specified [1.3.20]
		Interpersonal	Coaching	Helps others learn new skills [2.1.3]
		Thinking	Knowing How to Learn	Uses available resources to apply new skills [4.3.6]

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
3.5 Identify how tap and drill sizes are selected		Foundation	Speaking	Asks questions to clarify information [1.5.3]  Speaks in a clear, concise manner [1.5.12]
		Thinking	Creative Thinking	Finds new ways of dealing with existing problems/situations [4.1.5]
			Decision Making	Evaluates information/data to make best decision [4.2.5]

## Unit 4: Sheet Metal & Soldering

### 10 Hours

Terminology: Flux, Solder, Soldering, Sweating, Tinning

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
4.1 Define terms		Foundation	Reading	Follows written directions [1.3.13]
			Writing	Applies rules of grammar, punctuation, capitalization, and spelling [1.6.3]  Presents answers/conclusions in a clear and understandable form [1.6.13]
4.2 Explain safety precautions necessary in sheet metal work and soldering		Foundation	Listening	Listens to follow directions [1.2.6]
			Speaking	Organizes ideas and communicates oral messages to listeners [1.5.7]
		Interpersonal	Teamwork	Recognizes effects of positive/negative attitudes on co-workers [2.6.4]
		Thinking	Reasoning	Applies rules and principles to a new situation [4.5.1]

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
4.3 Identify tools used in sheet metal work and soldering		Foundation	Reading	Analyzes and applies what has been read to specific task [1.3.2]  Applies/understands technical words that pertain to subject [1.3.6]
		Thinking	Reasoning	Sees relationship between two or more ideas, objects, or situations [4.5.5]
4.4 List the steps for laying out and cutting sheet metal	4.4.1 Demonstrate the ability to lay out and cut sheet metal.	Foundation	Reading	Follows written directions [1.3.13]  Interprets drawings to obtain factual information [1.3.17]
		Personal Management	Responsibility	Pays close attention to details [3.4.8]  Sets high standards for self in completion of task [3.4.9]
		Thinking	Seeing Things in the Mind's Eye	Organizes and processes images -- symbols, pictures, graphs, objects, etc. [4.6.2]  Visualizes a finished product [4.6.4]

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
4.5 Discuss types of soldering	4.5.1 Demonstrate the ability to solder sheet metal.	Foundation	Listening	Comprehends ideas and concepts related to [1.2.1]  Listens for content [1.2.3]  Listens to follow directions [1.2.6]
		Interpersonal	Teamwork	Works effectively with others to reach a common goal [2.6.6]
		Thinking	Problem Solving	Interprets drawings to solve design problems [4.4.7]
4.6 Explain how a pop riveter is used	4.6.1 Demonstrate the ability to use a pop riveter.	Foundation	Writing	Adapts notes to a proper form [1.6.1]  Uses technical words and symbols [1.6.20]  Writes/prints legibly [1.6.24]
		Personal Management	Integrity/ Honesty/ Work Ethic	Complies with safety and health rules in a given work environment [3.2.2]  Describes desirable worker characteristics [3.2.3]

## Unit 5: Tool Fitting

### 5 Hours

Terminology: Bench stone, Concave, Convex, Hollow ground, Mushroomed, Recondition

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
5.1 Define terms		Foundation	Reading  Writing	Follows written directions [1.3.13]  Applies rules of grammar, punctuation, capitalization, and spelling [1.6.3]  Presents answers/conclusions in a clear and understandable form [1.6.13]
5.2 Safety practices needed in tool fitting		Foundation   Personal Management  Thinking	Reading   Responsibility  Reasoning	Analyzes and applies what has been read to specific task [1.3.2]  Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]  Maintains a high level of concentration in completing a task [3.4.7]  Applies rules and principles to a new situation [4.5.1]  Extracts rules or principles from written information [4.5.4]



CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
5.3 Identify tools used in tool fitting and their functions	5.3.1 Show and demonstrate tool use, including tap and die and Bench grinder	Foundation	Listening	Comprehends ideas and concepts related to tool fitting [1.2.1]  Listens for content [1.2.3]
		Interpersonal	Coaching	Encourages others to develop personal and professional skills [2.1.2]
		Thinking	Seeing Things in the Mind's Eye	Organizes and processes images -- symbols, pictures, graphs, objects, etc. [4.6.2]

## Unit 6: Oxyacetylene Gas Welding and Cutting

### 10 Hours

Terminology: Backfire, Filler rod, Flashback, Fusion, Puddle, Tack weld

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
6.1 Define terms		Foundation	Reading	Follows written directions [1.3.13]
			Writing	Applies rules of grammar, punctuation, capitalization, and spelling [1.6.3]  Presents answers/conclusions in a clear and understandable form [1.6.13]
6.2 Explain safety precautions needed in oxyacetylene gas welding		Foundation	Writing	Presents answers/conclusions in a clear and understandable form [1.6.13]  Summarizes written information [1.6.17]
				Complies with safety and health rules in a given work environment [3.2.2]  Describes desirable worker characteristics [3.2.3]
		Thinking	Knowing How to Learn	Applies new knowledge and skills to welding [4.3.1]  Processes new information as related to workplace [4.3.5]

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
6.3 Identify tools and equipment used in gas welding	6.3.1 Assemble oxyacetylene gas welding equipment for use.	Foundation	Speaking	Communicates a thought, idea, or fact in spoken form [1.5.5]  Responds to listener feedback [1.5.10]
		Personal Management	Responsibility	Exhibits enthusiasm in approaching and completing tasks [3.4.3]  Pays close attention to details [3.4.8]
		Thinking	Reasoning	Sees relationship between two or more ideas, objects, or situations [4.5.5]
6.4 Compare different types of flames	6.4.1 Demonstrate proper set-up for neutral, oxidizing, and carburizing flames.	Foundation	Science	Monitors variables in experiment [1.4.18]  Records data [1.6.16]
		Thinking	Problem Solving	Draws conclusions from observations, evaluates conditions, and gives possible explanations [4.4.5]

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
6.5 Explain the process of oxyacetylene cutting	6.5.1 Demonstrate the process of cutting steel.	Foundation	Writing	Applies/Uses technical words and concepts [1.6.3]  Presents answers/conclusions in a clear and understandable form [1.6.13]  Writes logical and understandable sentences [1.6.23]
		Personal Management	Organizational Effectiveness	Presents personal skills as benefits for company objective [3.3.7]
		Thinking	Creative Thinking	Develops visual aids to create audience interest [4.1.4]
6.6 Discuss the different types of rods and their uses in welding	6.6.1 Demonstrate the ability to weld the following joints: Corner Weld (without rod), Butt Weld (with rod), Filet (with rod)	Foundation	Speaking	Adapts presentation to audience [1.5.1]  Applies/uses technical terms as appropriate to audience [1.5.2]  Organizes ideas and communicates oral messages to listeners [1.5.7]
		Thinking	Decision Making	Demonstrates decision-making skills [4.2.4]  Evaluates information/data to make best decision [4.2.5]
			Reasoning	Uses logic to draw conclusions from available information [4.5.6]

## Unit 7: Arc Welding

### 20 Hours

Terminology: Alternating current, American Welding Society, Arc, Direct Current, Duty cycle, Electrode, Slag

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
7.1 Define terms		Foundation	Reading	Follows written directions [1.3.13]
			Writing	Applies rules of grammar, punctuation, capitalization, and spelling [1.6.3]  Presents answers/conclusions in a clear and understandable form [1.6.13]
7.2 Explain safety precautions needed in arc welding		Foundation	Speaking	Communicates a thought, idea, or fact in spoken form [1.5.5]  Speaks in a clear, concise manner [1.5.12]
7.3 Identify tools and equipment used in arc welding		Foundation	Reading	Applies information to job performance [1.3.4]  Identifies relevant details, facts, and specifications [1.3.16]
7.4 Compare different types of electrodes		Foundation	Reading	Distinguishes between fact and opinion [1.3.11]  Interprets drawings to obtain factual information [1.3.17]

CAREER AND TECHNICAL SKILLS What The Student Should Be Able To Do		ACADEMIC AND WORKPLACE SKILLS What The Instruction Should Reinforce		
Knowledge	Application	Skill Group	Skill	Description
7.5 Discuss different types of welds used with various joints		Foundation	Reading	Comprehends written specifications and applies them to a task [1.3.9]  Uses appropriate materials and techniques as specified [1.3.20]
			Speaking	Organizes ideas and communicates oral messages to listeners [1.5.7]
7.6 List the steps in preparing metal for welding	7.6.1 Demonstrate the ability to strike and maintain an arc.  7.6.2 Demonstrate the process of running beads.	Foundation	Writing	Composes and creates document -- letters, manuals, reports, proposals, graphs, flow charts, etc. [1.6.8]
7.7 Compare the capabilities of GTAW and GMAW welding		Foundation	Writing	Analyzes data, summarizes results, and makes conclusions [1.6.2]  Evaluates written information for appropriateness/ content/clarity [1.6.9]

# **Glossary**

## **Unit 1: Introduction to Agriculture Metals**

1. Agriculture – the production of plants, animals, and related enterprises
2. Career – a chosen occupation
3. Metal – substance with certain properties that allow it to be fused together by applying heat
4. Occupation – someone's business, employment or trade
5. Welding – process to fuse two pieces of metal

## **Unit 2: Safety Orientation and Procedures**

1. Decibel – standard unit of sound
2. Noise duration – length of time a person is exposed to sound
3. Noise intensity – the energy of sound waves
4. Safety – freedom from accidents
5. Safety colors – help alert people to dangers in the shop



## **Unit 3: Cold Metal Preparation**

1. Alloy – a mixture of two or more metals
2. Anneal – cooling steel slowly to make it soft
3. Ferrous – a metal that comes from iron ore
4. Malleable - workable
5. Non-ferrous – metals that do not contain iron ore
6. Tempering – controlled cooling after heating metal to attain a degree of hardness

## **Unit 4: Sheet Metal & Soldering**

1. Flux – material that removes tarnish or corrosion, prevents corrosion from developing, and acts as an agent to help solder spread over metal
2. Solder – a mixture of tin or lead with other metals
3. Soldering - the joining of two materials with solder
4. Sweating – the process of soldering a fitting to a copper pipe
5. Tinning – cleaning the soldering copper coating with solder

## Unit 5: Tool Fitting

1. Bench stone – a sharpening stone designed to rest on a bench
2. Concave – curved inward
3. Convex – curved out
4. Hollow ground – a blade with teeth wider at the points than at the base
5. Mushroomed - a pushed-over condition caused by being struck repeatedly over a period of time
6. Recondition – restore a tool to good working condition

## **Unit 6: Oxyacetylene Gas Welding and Cutting**

1. Backfire – a loud pop in a torch that generally blows out the flame
2. Flashback – a fire inside the torch handle that causes a squealing or hissing sound
3. Filler rod – long thin rods used to add metal when brazing or welding
4. Fusion – joining by melting
5. Puddle – a small pool of liquid metal
6. Tack weld – a weld made to hold parts to be welded together

## **Unit 7: Arc Welding**

1. Alternating current – reverses its direction in the circuit sixty times per second
2. American Welding Society – an organization that supports education in welding processes
3. Arc – the discharge of electricity through an air space
4. Direct Current – flows in one direction continuously
5. Duty cycle – the proportion of time a motor or welder can run without overheating
6. Electrode – a metal welding rod covered with flux
7. Slag – impurities that rise to the top of the weld and harden